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CONDITION SURVEY, ROBERT GRAY ARMY AIRFIELD, FORT HOOD, TEXAS.(U)
APR 73 P J VEDROS, R D JACKSON

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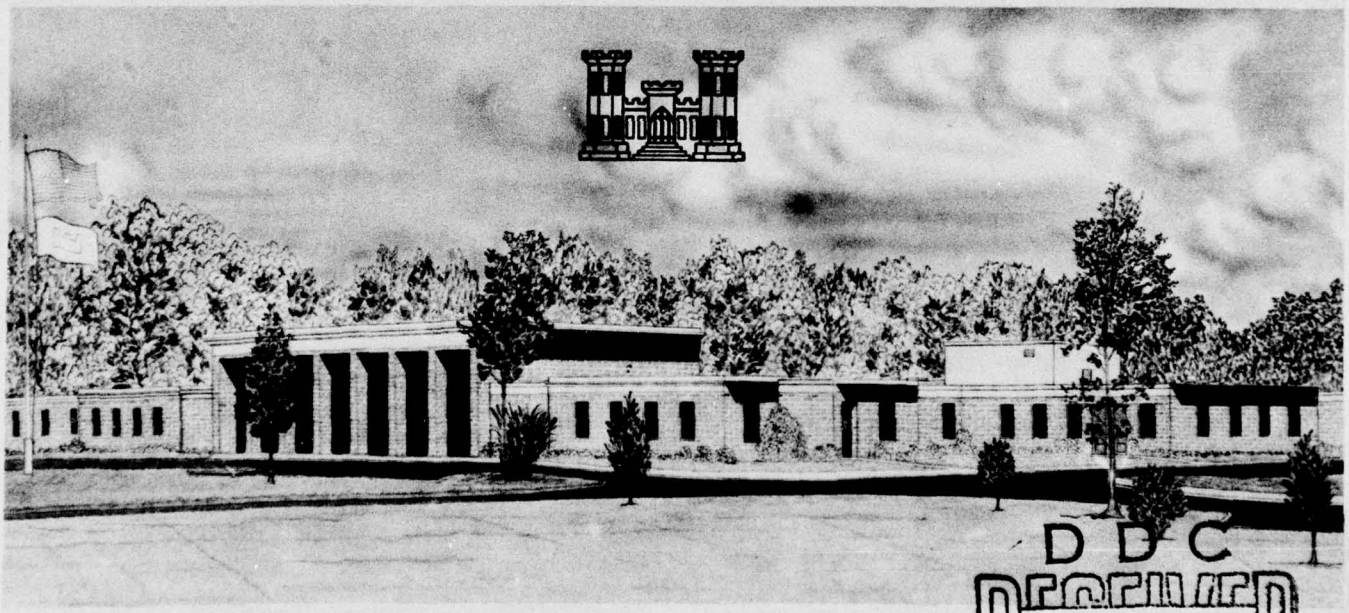
CONDITION SURVEY, ROBERT GRAY ARMY AIRFIELD, FORT HOOD, TEXAS

by

P. J. Vedros, R. D. Jackson



April 1973

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Soils and Pavements Laboratory
Vicksburg, Mississippi

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ARMY-MRC VICKSBURG, MISS

Foreword

Authority for conducting condition surveys at selected airfields is contained in Long-Range Program, O&M,A, FY 1972, Project Q6-1: "Engineering Criteria for Design and Construction - WES," dated 1 July 1971.

The facilities at Robert Gray Army Airfield, Fort Hood, Texas, were inspected during January 1972 by Mr. R. D. Jackson of the Engineering Design Criteria Branch, U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. This report was prepared by Messrs. Jackson and P. J. Vedros under the general supervision of Messrs. J. P. Sale, R. G. Ahlvin, and R. L. Hutchinson of the Soils and Pavements Laboratory, WES.

COL Ernest D. Peixotto, CE, was Director of the WES during the conduct of the study and preparation of this report. Mr. F. R. Brown was Technical Director.

Contents

Conversion Factors, British to Metric Units of Measurement

British units of measurement used in this report can be converted to metric units as follows:

Multiply	By	To Obtain
inches	2.54	centimeters
feet	0.3048	meters
miles (U. S. statute)	1.609344	kilometers
square inches	6.4516	square centimeters
pounds (mass)	0.45359237	kilograms
pounds (force) per square inch	0.6894757	newtons per square centimeter
Fahrenheit degrees	*	Celsius or Kelvin degrees

* To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: $C = (5/9)(F - 32)$. To obtain Kelvin (K) readings, use: $K = (5/9)(F - 32) + 273.15$.

CONDITION SURVEY, ROBERT GRAY ARMY AIRFIELD
FORT HOOD, TEXAS

Purpose

1. The purpose of this report is to present the results of an inspection performed at Robert Gray Army Airfield (RGAAF), Fort Hood, Texas, during January 1972. The inspection was limited to visual observations, and no tests were conducted on any of the pavement facilities. A layout of the airfield is shown in plate 1.

Pertinent Background Data

General description of airfield

2. RGAAF is located in the northwestern part of Bell County, 8 miles* southwest of Killeen, Texas, and 3 miles south of U. S. Highway 190. A vicinity map is shown in plate 1.

3. The airfield is located in an area of rolling to hilly topography. Geologically, the airfield is located in outcrops of the Fredericksburg group of Cretaceous age. The topsoil consists chiefly of gray-to-brown, calcareous sandy clays varying in thickness from a few inches to 5 ft. The underlying materials are generally weathered and disintegrated and consist of nodules of limestone with clay binder and a mixture of shell, limestone, and clay. During exploration for the construction of the airfield, the water table was not encountered in 25-ft-deep borings.

4. The climate in the vicinity is mild. The highest and lowest temperatures in 1971 were 101 and 16 F recorded on 15 July and 8 February, respectively. The average monthly temperature for the year of 1971 was 68 F. Total precipitation during the same period was 39.95 in. Temperature and precipitation data for the year of 1971 are summarized in table 1.

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* A table of factors for converting British units of measurement to metric units is presented on page vii.

5. In January 1972, the airfield consisted of a NW-SE (15-33) runway, approximately 200 ft wide and 10,000 ft long; two parking aprons; a parallel taxiway; two alert aprons with taxiways to the runway; four connecting taxiways; and a warm-up apron.

Previous reports

6. Previous reports describing the airfield facilities at RGAAF are listed below. Pertinent data were extracted from them for use in this condition survey report.

a. U. S. Army Engineer District, Galveston, CE, "Pavement Evaluation, Camp Hood Landing Strip, Killeen, Texas," July 1948, Galveston, Texas.

b. U. S. Army Engineer District, Fort Worth, CE, "Pavement Evaluation Report," February 1956, Fort Worth, Texas.

c. U. S. Army Engineer Waterways Experiment Station, CE, "Airfield Pavement Evaluation Report, Gray Air Force Base, Killeen, Texas," Miscellaneous Paper No. 4-313, June 1958, Vicksburg, Mississippi.

d. _____, "Army Airfield Pavement Evaluation, Robert Gray Army Airfield, Fort Hood, Texas," Miscellaneous Paper No. 4-697, January 1965, Vicksburg, Mississippi.

e. _____, "Condition Survey, Robert Gray Army Airfield, Fort Hood, Texas," Miscellaneous Paper No. 4-989, April 1968, Vicksburg, Mississippi.

f. _____, "Airfield Pavement Evaluation, Robert Gray Army Airfield, Fort Hood, Texas," Miscellaneous Paper S-69-38, August 1969, Vicksburg, Mississippi.

g. _____, "Airfield Pavement Evaluation, Robert Gray Army Airfield, Fort Hood, Texas," Supplement to Miscellaneous Paper S-69-38, June 1970, Vicksburg, Mississippi.

History of Airfield Pavements

Construction history

7. The construction of RGAAF has been accomplished during four major construction periods, with subsequent periods of reconstruction. Typical sections of various facilities are shown in plate 2. Plate 3 shows a layout of the subsurface and the drainage system.

a. 1946-47 construction. Facilities constructed during this

period included a 200-ft-wide by 8,400-ft-long NW-SE runway, the north parking apron, the parallel taxiway, and two alert aprons and connecting taxiways. These pavements were designed to support operations of B-29 aircraft (gross loading of 140,000 lb).

b. 1951 construction. The south parking apron, which was constructed during 1951, was also designed to support B-29 aircraft operations.

c. 1952-53 construction. Construction during 1952-53 included extensions to the runway (1,600 ft to the south end), the parallel taxiway, and the south parking apron. These pavements were designed to support a landing gear load of 85,000 lb on dual wheels spaced 37.5 in. center to center, with each wheel having a contact area of 267 sq in. A blast area designed for a 5,000-lb, single-wheel load was constructed at the south end of the taxiway extension.

d. 1956 construction. A portland cement concrete (PCC) warm-up apron was constructed at the north end of the taxiway during 1956. The pavement was designed to support a landing gear load of 100,000 lb on dual wheels spaced 37.5 in. center to center, with each wheel having a contact area of 267 sq in. The blast area constructed adjacent to the warm-up apron was designed for a single-wheel load of 5,000 lb.

e. 1963 reconstruction. A 1,500-ft section of the runway (sta 75+00 to 90+00) was reconstructed in 1963 because of failures that had developed.

f. 1965 reconstruction. During the summer of 1965, a 1,900-ft section of the runway (sta 56+00 to 75+00) was reconstructed, because distress had occurred in the pavements.

g. 1968-69 reconstruction. In 1968, a 3,600-ft section of the runway (sta 20+00 to 56+00) was reconstructed because of pavement failures. The base course for this section and the pavements from sta 20+00 to 39+00 were completed in 1968. In 1969, the pavement from sta 39+00 to 56+00 was completed. Taxiway 3 was reconstructed in 1969. The runway from sta 6+00 to 20+00 was reconstructed in 1969.

h. 1970 reconstruction. Taxiway 2 and the runway from sta 90+00 to 106+00 were reconstructed in 1970. The reconstruction on the runway from sta 90+00 to 96+00 consisted of removal of the asphaltic concrete (AC) pavement and base course; lime stabilization of the top 8 in. of the subgrade; and placement of 7 in. of limestone subbase (reclaimed base), 7 in. of new limestone base material, and 4 in. of AC. From runway sta 96+00 to 101+00, the AC and base course were removed and replaced with 13 in. of

PCC pavement with a flexural strength of 650 psi. The reconstruction from runway sta 101+00 to 106+00 was the same as that from sta 96+00 to 101+00, except the thickness of the PCC pavement was 15 in.

i. 1971-72 reconstruction. The north parking apron and a section of the parallel taxiway adjacent to it were reconstructed during 1971-72. Reconstruction of the apron consisted of removing the AC pavement and base course, and replacing them with 4 in. of sand and 13 in. of PCC pavement with a flexural strength of 650 psi. The work on the parallel taxiway consisted of removing the AC and base course and replacing them with 2 in. of sand and 15 in. of PCC.

Traffic history

8. Accurate traffic records for RGAAF prior to 1965 are not available. However, it was reported that a large number of cycles* of operations were applied by B-47 and B-36 aircraft prior to 1957 and that KC-97, T-29, T-33, and C-124 aircraft operated from the field during 1957-60. From 1965-May 1969, traffic of the heavier aircraft was as follows: 541 cycles of C-124 traffic; 217 cycles of C-130 traffic; 89 cycles of C-133 traffic; 6 cycles of C-135 traffic; 34 cycles of C-140 traffic; 6 cycles of 727 traffic; and 121 cycles of C-141 traffic. Traffic records were not available for the period 1 June 1969-31 December 1969. During 1970, approximately 8,000 cycles of traffic were applied by Air Force heavy aircraft, including C-5A's. Aircraft traffic increased during 1971 to approximately 13,000 cycles of Air Force heavy aircraft. In addition to the above-mentioned traffic, RGAAF receives some traffic from small Army-type, fixed- and rotary-wing aircraft. RGAAF is utilized by the Air Force for touch-and-go operations for jet training aircraft.

Conditions of Pavement Surfaces

9. The conditions of the pavement surfaces at the time of inspection ranged from good to excellent. The runway was in very good to

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* A cycle of traffic is one takeoff and one landing.

excellent condition. Photo 1 shows the generally good condition of the AC pavement of the runway (looking north from sta 56+00). Photo 2 shows a general view of the PCC pavement of the runway (looking south from sta 96+00), which was in excellent condition. A longitudinal paving lane crack near sta 56+00 is shown in photo 3. The AC portion of the parallel taxiway was in very good condition (photo 4), even though there were many skid marks from rotary-wing aircraft operations. The south parking apron was in good condition (photo 5). The north half of the PCC north parking apron was in excellent condition (photo 6). At the time of this inspection, the concrete was being poured for the south half of the apron. The pavement facilities not specifically mentioned above were in good to excellent condition.

Maintenance

10. Because of a major reconstruction program, only limited maintenance has been performed by the Army since it took over the operation of RGAAF in 1963. The major maintenance effort was to overlay the parallel taxiway and the south parking apron in 1971 at a cost of approximately $100,000.

Evaluation

11. The pavement evaluation shown in tables 2 and 3 is based on the pavement thicknesses shown on construction drawings and on field tests performed by WES personnel in 1964 and 1969. The primary pavement system is considered to be the runway, the parallel taxiway, north parking apron, and taxiways 1 and 4. The basic field evaluation is controlled by the extension to the south end of the parallel taxiway. The pavement section consists of 9 in. of AC over 11 in. of crushed limestone base course (CBR of 40) over the subgrade (CBR of 10). The south parking apron had a weaker pavement section; however, this facility was not considered as part of the primary pavement system, since it does not have to be used in operating from the airfield.

Table 1

Temperature and Precipitation Data

Month	1971 Average Temperature, F	1971 Precipitation in.
January	52.4	0.00
February	53.5	1.32
March	59.1	0.39
April	66.6	1.57
May	75.2	4.85
June	82.2	1.93
July	84.3	16.16
August	80.0	2.18
September	78.0	2.29
October	71.3	5.37
November	59.2	1.66
December	54.7	2.23
Annual	68.0	39.95

Note: Highest temperature in 1971 was 101 F on July 15; lowest temperature in 1971 was 16 F on February 8.

Table 2

Summary of Basic Field Evaluation, February 1972

Pavement Facility	Allowable Gross Aircraft Loading, lb			
	Normal Period Operation		Frost-Melting Period Operation	
	Single-Wheel Gear	Twin-Wheel Gear	Single-Wheel Gear	Twin-Wheel Gear
NW-SE runway	70,000+	50,000+	70,000+	50,000+
Parallel taxiway	70,000+	50,000+	70,000+	50,000+
Parallel taxiway, south extension*	70,000+	50,000+	70,000+	50,000+
Taxiway 4	70,000+	50,000+	70,000+	50,000+
Taxiway 1	70,000+	50,000+	70,000+	50,000+
North parking apron	70,000+	50,000+	70,000+	50,000+

* Basic field evaluation

Table 3

Summary of Pavement Evaluation for Overload Aircraft

Overload Aircraft			Allowable Gross Aircraft Load, lb		
Type Aircraft	Weight, lb Empty	Weight, lb Gross	One Cycle per Day	One Cycle per Week	One Cycle per Month
C-123	30,000	60,000	▨	▨	▨
C-131	30,700	60,000	▨	▨	▨
C-119	41,000	77,000	▨	▨	▨
C-54	39,000	82,500	▨	▨	▨
C-130	69,837	155,000	▨	▨	▨
C-124	100,700	216,000	▨	▨	▨
C-141	134,000	316,000	256,000	▨	▨
C-5A	318,200	770,000	725,000	▨	▨

▨ Aircraft can operate at maximum gross load.

256,000 Aircraft can operate at indicated gross load.

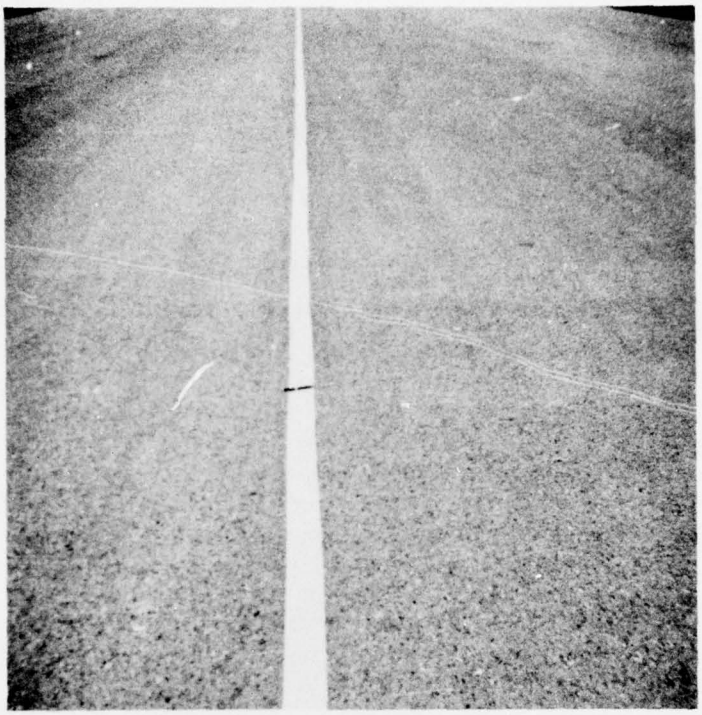


Photo 1. AC pavement on runway looking north from sta 56+00

Photo 2. General view of PCC pavement on runway looking south from sta 96+00

Photo 3. Paving lane crack in AC pavement near sta 56+00

Photo 4. View of parallel taxiway showing helicopter skid marks

Photo 5. General view of south parking apron

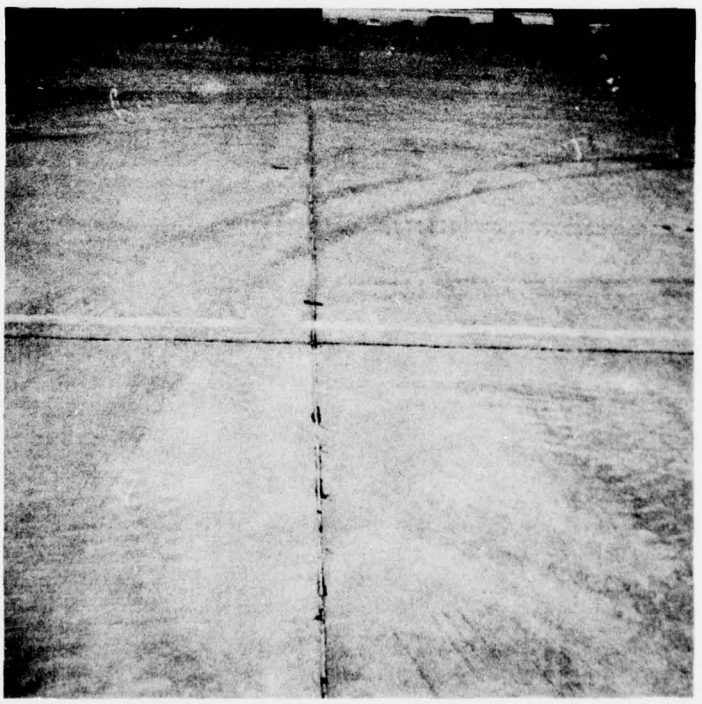
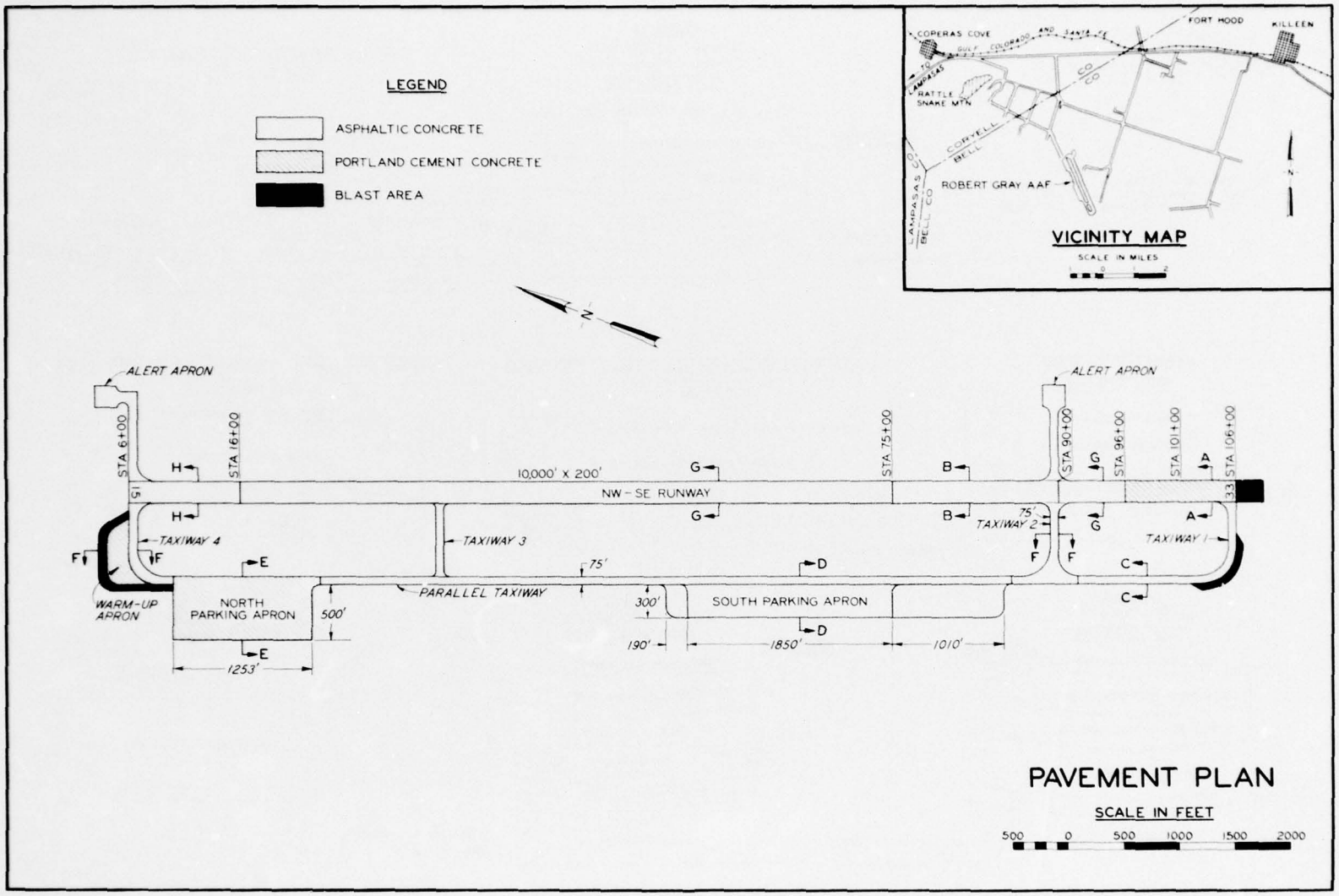


Photo 6. View of north end of north parking apron



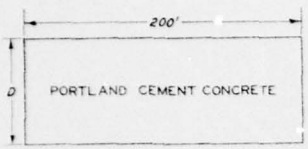
PAVEMENT PLAN

SCALE IN FEET

500 0 500 1000 1500 2000

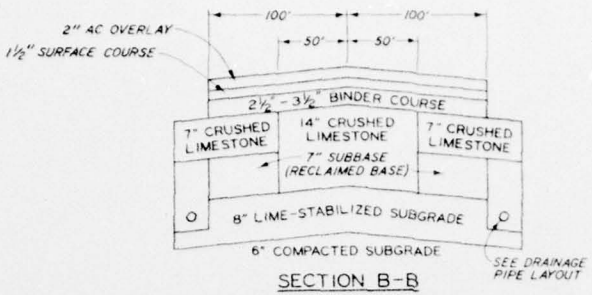
PLATE 1

PLATE 2



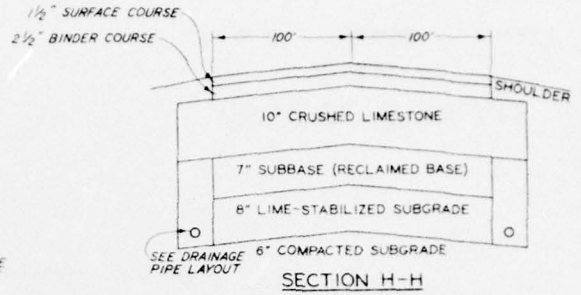
SECTION A-A

STA 96+00 - 101+00, D=13 IN.
STA 101+00 - 106+00, D=15 IN.
RUNWAY



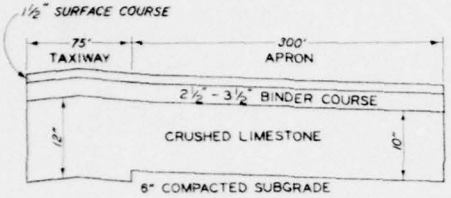
SECTION B-B

STA 75+00 - 90+00
RUNWAY



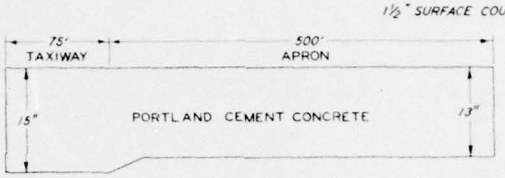
SECTION H-H

STA 6+00 - 16+00
RUNWAY



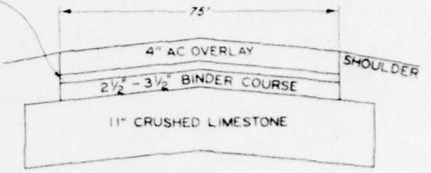
SECTION D-D

PARALLEL TAXIWAY AND SOUTH PARKING APRON



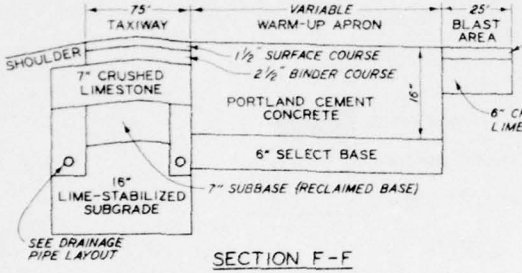
SECTION E-E

PARALLEL TAXIWAY AND NORTH PARKING APRON



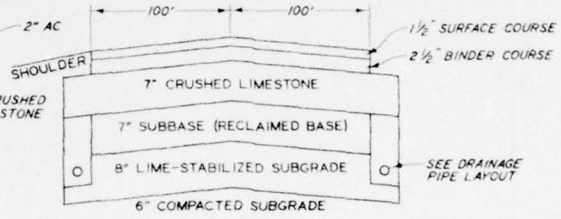
SECTION C-C

TAXIWAY EXTENSION



SECTION F-F

TAXIWAY 4 AND WARM-UP APRON

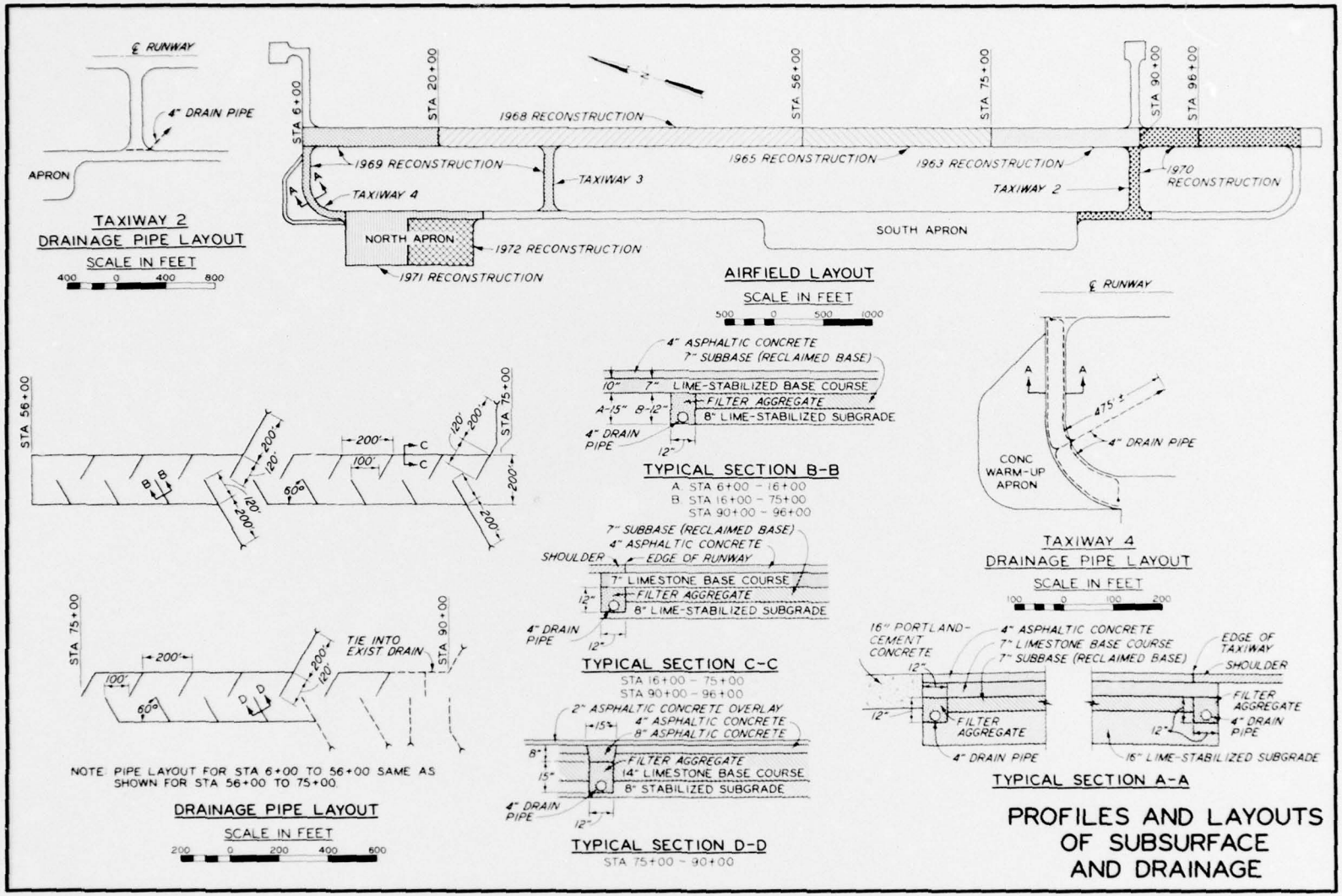


SECTION G-G

STA 16+00 - 75+00
STA 90+00 - 96+00
RUNWAY

NOTE: SECTION SAME FOR TAXIWAY 2 AS SHOWN IN SECTION F-F FOR TAXIWAY 4 EXCEPT FOR DRAINAGE LAYOUT.

TYPICAL PAVEMENT SECTIONS



PROFILES AND LAYOUTS OF SUBSURFACE AND DRAINAGE

PLATE 3